

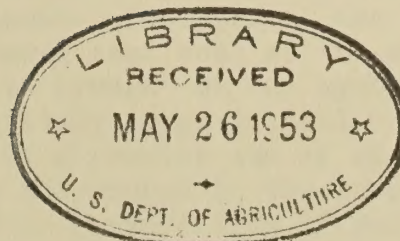
TEXAS 150 PRESIDIO

FIELD APPRAISAL ANALYSIS

Prepared by
Field Appraisal Section
Program Analysis Division
RURAL ELECTRIFICATION ADMINISTRATION

Field Appraisal
Completed in
December 1952

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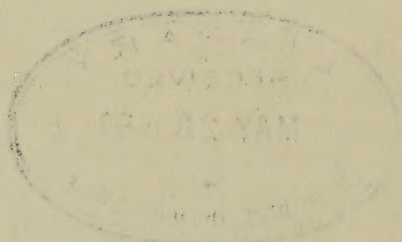


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March 25, 1953

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Field Appraisal Section
Program Analysis Division

SUMMARY AND CONCLUSION
TEXAS 150 PRESIDIO

AREA CHARACTERISTICS

The area to be served initially by the proposed system is comprised of widely separated segments of several counties in southwest Texas. The counties involved are Hudspeth, Culberson, Jeff Davis, Reeves, and Presidio. It is believed that the segments are scattered over such a wide area as to preclude an integrated system of distribution lines. Farms in the 5-county area average over 12,000 acres, and their average value is \$161,000. Income per farm from sale of farm products averaged \$28,900 in 1949. Population of the area increased by almost 5 percent over the last decade.

Livestock accounts for 50 percent of all income from farm products. In 1944, income from livestock represented 80 percent. This decrease indicates the growing importance of irrigated crops under cultivation, principally cotton and alfalfa. Climatic conditions are favorable to high quality range grasses and permit yearlong grazing. Elevation varies from 2,400 feet to 7,750 feet. Average rainfall ranges from 7 to 16 inches depending largely on elevation. Marketing, transportation, and credit facilities appear to be adequate.

ULTIMATE NUMBER OF CONSUMERS

The proposed system has signed applications for 290 services. It expects to increase this number by 81 percent to a total of 526 shortly after energization. If the trend toward more irrigation continues, it is entirely reasonable that the expected number of consumers, as stated by the cooperative, will be achieved.

ESTIMATED FUTURE CONSUMPTION OF ELECTRICITY

Farmers indicated an average monthly usage of 448 kwh to be attained 3 years after energization. Small commercial consumers indicated an average of 420 kwh to be attained over the same period. Many of the farmers indicated that they planned to have more than one dwelling served through a single meter. In the event that this is not permitted by the officials of the cooperative, the indicated average farm consumption would be 360 kwh per month. One-half of the farmers had home electric plants, and it is believed that most of the appliances they have in their possession would be brought on the system's lines at the outset. For this reason a relatively large initial usage might be expected. One major deterrent to a greater use of electricity is LP gas which appears to be solidly entrenched in the area. Many respondents stated that they did not intend to convert from LP gas to electricity in those uses where they normally compete.

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Based on the random sample of potential consumers and other factors believed to be significant, this analysis leads to the following estimates, which are certified as being reasonable and may be expected to be attained at periods following energization as specified.

<u>Class of Consumer</u>	<u>Average Monthly Kwh to be Attained Following Energization</u>		
	<u>In 2 Yrs</u>	<u>In 5 Yrs</u>	<u>In 10 Yrs</u>
Farm ^{1/}	200	300	450
Small Commercial ^{2/}	400	450	500
Irrigation ^{3/}	60,480	60,480	60,480

1/ Based on the assumption that each rural dwelling will be metered separately.

2/ Includes one school.

3/ Annual estimate per well.

E. C. Weitzell, Chief
Program Analysis Division

March 25, 1953

Field Appraisal Section
Program Analysis Division

ANALYSIS OF BASIC FACTORS RELATED TO THE
RURAL ELECTRIFICATION LOAN FOR
TEXAS 150 PRESIDIO

This analysis of the probable future consumption of electricity for the Big Bend Electric Cooperative, Inc., which proposes to serve parts of several counties in western Texas, is based on a field study conducted by Vergil Bufford, Field Representative, and was completed during December 1952. The field work consisted primarily of visits to 50 potential consumers of which 44 were farm and nonfarm residences, 5 were commercial establishments, and 1 was a school.^{1/} In addition to these visits, information relating to the future for electric power consumption in the area was obtained from local businessmen, agricultural leaders, and county agents. This analysis was prepared by Arthur S. Hiatt, Agricultural Economist.

Generalized information included in this analysis was taken from the U. S. Censuses of Population and Agriculture. All census data used pertain to Culberson, Hudspeth, Jeff Davis, Presidio, and Reeves Counties.

PROPOSED SERVICE AREA

The area proposed to be served initially is primarily comprised of widely separated unserved "pockets" in several counties in west Texas (Figure 1). These areas are best defined as (1) the Dell City area which lies in the extreme northwestern portion of Hudspeth County and extends for short distances into Otero County, New Mexico, (2) the Sierra Blanca area which includes most of the remainder of Hudspeth County, (3) the Van Horn or Lobo Flats area in Culberson and Jeff Davis Counties which lies south of Van Horn and along Wild Horse Creek, (4) the Marfa area in the northern part of Presidio County, and (5) the Pecos area which lies southwest of the city of Pecos in Reeves County. Ultimate boundaries have not been established by this proposed system.

The area along the Texas side of the Rio Grande River, north and south of Presidio, Texas, was included in the original project for which a loan application was submitted to REA in 1949. The appraiser was informed that all the farmers in this area have signed 5-year contracts with the West Texas Utility Company, and that about 50 percent of the construction of the lines has been completed. This entire area has been deleted from the revised proposed project.

^{1/} Respondents in the survey were randomly selected from tabular lists and comprise a sample of 10 percent of the consumers proposed to be served in the area.

ULTIMATE NUMBER OF CONSUMERS

According to the revised application, this cooperative has applied for funds for the purpose of financing the construction of electric facilities to serve 526 consumers, 290 of which reportedly have signed applications for service. The cooperative has not submitted an estimate of the ultimate number of consumers they expect to serve. The appraiser was furnished tabular lists of signed and prospective consumers in each of the general areas mentioned above, and he attempted to secure a 10 percent sample from each area. Of the 49 prospective farm consumers drawn, 7 proved to be either vacant homes or places where no dwellings now exist. Usable schedules were obtained from 44 farm and nonfarm units, 5 commercial establishments, and 1 school. The expanded sample indicates an estimated number of 500 consumers to be served in the area.

The appraiser noted that in some instances signed members on the tabular lists proved to be stock water wells; some signees had no dwellings on their ranches or farms at the time of the appraisal; some members had been permitted to sign more than one application when actually only one meter would be used; and the degree of isolation of some of the members practically precluded them from receiving service on a feasible basis. For these reasons and because the appraiser was not provided a master tabular list of all signed and potential members, properly classified and accurately located on maps, it would be difficult to estimate the ultimate number of consumers for this system at this time.

The cooperative submitted individual schedules concerning 244 prospective irrigation consumers with their revised application. It is expected that additional irrigation consumers will be in need of electric service as the irrigated farming potential in this area continues to develop. In the opinion of the appraiser, the feasibility of the proposed project would be extremely doubtful without the irrigation load.

NATURE OF INDICATED FUTURE CONSUMPTION OF
ELECTRICITY AS REVEALED BY THE SURVEY

A tabulation of the raw data secured from the respondents revealed average monthly consumption figures presented in Table I.

TABLE I
INDICATED MONTHLY KWH CONSUMPTION

Consumer Class	Indicated Future Consumption ^{1/}
Farm and Nonfarm ^{2/}	448
Small Commercial ^{3/}	420

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- 1/ Within 3 years after they receive central station electric service.
- 2/ Includes ranches as used in this analysis.
- 3/ Includes one school.

About one-half of the respondents stated that they had home electric plants of some type, but no estimate was made of the kwh generated from these plants. All respondents having such plants indicated a desire to retire them as soon as possible. Several of the respondents expressed intentions of having more than one dwelling, including attendant electric appliances, all on one meter. This practice would result in a higher average kwh consumption than would occur if each dwelling were required to have a separate meter.

Table II presents in detail the expected future saturation of appliances for all farm and nonfarm respondents in the survey as indicated by them at the time of the appraisal.

TABLE II
ESTIMATED POTENTIAL SATURATION ELECTRICAL APPLIANCES
AND EQUIPMENT FARM AND NONFARM CONSUMERS

Appliance or Equipment	Potential Saturation ^{1/} (Percent)	Unit Requirement ^{2/} (Kwh)	Total Kwh Per 100 Consumers ^{3/}
Air Conditioning Unit	11	3,200	35,200
Air Compressor	43	35	1,505
Battery Charger	14	12	168
Blanket	23	150	3,450
Brooder, Hover	2	216	432
Churn	11	3	33
Clock	59	18	1,062
Clothes Drier	7	700	4,900
Dishwasher	18	30	540
Drill Press	52	12	624
Evaporative Cooler	30	72	2,160
Fan (Exhaust, Kitchen)	2	15	30
Fan (Household)	25	15	375
Feed Chopper	2	12	24
Food Mixer	75	25	1,875
Forge	4	12	48
Freezer Cabinet	68	900	61,200
Freezer Cabinet (Walk-in type)	7	1,500	10,500
Garbage Disposal	2	24	48

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Appliance or Equipment	Potential Saturation ¹ / (Percent)	Unit Requirement ² / (Kwh)	Total Kwh Per 100 Consumers ³
Garden Watering	9	75	675
Heating Pad	32	3	96
Hot Plate	2	70	140
Iron	93	100	9,300
Ironer	20	120	2,400
Lathe	4	12	48
Lighting			
Barracks	4	100	400
Bunk House	34	15	510
Garage	30	8	240
General Barn	48	24	1,152
Grain and Feed Storage Building	4	2	8
House	100	240	24,000
Milk House	4	35	140
Other Buildings	18	12	216
Poultry Laying House	4	35	140
Shop	30	12	360
Yard	86	18	1,548
Livestock Watering	27	180	4,860
Oil Furnace	2	300	600
Percolator	68	60	4,080
Power Saw	14	12	168
Pressure System Lift 22' or less	14	180	2,520
Pressure System Lift over 22'	45	240	10,800
Radio	95	100	9,500
Range	30	1,200	36,000
Refrigerator	77	360	27,720
Roaster	2	480	960
Sewing Machine	27	10	270
Soldering Iron	16	15	240
Space Heater	7	70	490
Television Receiver	11	360	3,960
Toaster	82	35	2,870
Tool Grinder	52	25	1,300
Vacuum Cleaner	75	20	1,500
Waffle Iron	84	25	2,100
Washing Machine	84	35	2,940
Water Heater (with water system)	50	3,000	150,000
Water Heater (Pail)	2	300	600
Welder	39	75	2,925
Wood Saw	2	30	60

3-Table II - Texas 150 Presidio - March 25, 1953

TOTAL ANNUAL KWH USAGE PER 100 FARM AND NONFARM CONSUMERS	432,010
ANNUAL KWH USAGE PER FARM AND NONFARM CONSUMERS	4,320
MONTHLY KWH USAGE PER CONSUMER	360

Source: Field appraisal completed December 1952.

- 1/ Percent of all unserved farm and nonfarm residential respondents who were planning to use electrical appliances and equipment listed, within 3 years after the proposed system is energized as indicated by interviews with 44 respondents comprising a 10 percent sample drawn from tabular lists.
- 2/ Annual kwh average usage as determined by REA. Annual data used to account for seasonal variations.
- 3/ Data do not reflect instances where more than one of the same appliance exists per consumer except for instances where it was indicated that more than one residential dwelling would be served through one meter. Cases of two or more of the same appliance were rare and do not affect the overall pattern materially.

Except for the power requirements for irrigation, which are presented elsewhere in this analysis, only a small portion of the power load will be consumed for purely productive purposes. The major uses and the percent each are of the total power load (excluding irrigation) are presented in Table III.

TABLE III

MAJOR USES AND PERCENT OF TOTAL LOAD
AS INDICATED BY RESPONDENTS

Uses	Percent of Total Farm Load
Water Heating	34.7
Food Freezing	16.6
Cooking	8.3
Air Conditioning	8.1
Refrigeration	6.4
House Lighting	5.7
Water Systems	4.7
Productive Uses	4.1
Other Uses	11.4
Total	100.0

PHYSICAL CHARACTERISTICS

The proposed service area lies in southwest Texas and includes parts of Hudspeth, Culberson, Reeves, Jeff Davis and Presidio Counties. Topography varies from level land of the Rio Grande Valley and Lobo Flat, through rolling to hilly, to rugged mountainous country, dissected by scattered drainage ways that include stream courses, most of which are usually dry, and canyons. Elevation varies from 2,400 feet to 7,750 feet. High altitudes, sunshine, low rainfall, moderate summers and mild winters make this area exceptionally suited to the running of breeding herds. Although dry-land farming is impractical, climatic conditions favor the production and curing of high quality range grasses and permit yearlong grazing.

Average annual rainfall varies from 7 to 16 inches, depending largely on elevation. Heaviest rainfall is in the Davis Mountains. General rains are infrequent. The rainy season usually begins during June or July and extends through September or October. Average frost-free dates are from March 29 to October 26. The growing season conforms more closely to the rainy season than to frost-free days.

ECONOMIC CHARACTERISTICS

Historically, this area has primarily been devoted to cattle and sheep raising, with very little land in dry farming. The number of acres under irrigation has increased greatly in the last decade, and it appears that further expansion in this type of farming is very probable. Except for a few communities along the Rio Grande and where irrigation has taken a firm foothold, the area is very thinly settled. This fact presents a most difficult problem in connection with construction and successful operation of an electric distribution system.

Although the population of two of the counties (Jeff Davis and Presidio) decreased over the period from 1940-1950, a 4.6 percent increase occurred in the population of the 5-county area. The number of farms in the 5-county area decreased from 1,041 in 1945 to 803 in 1950. This decrease is largely the result of the merging of small farm units and farmstead abandonments. It is believed by local leaders that present number of farms will not decrease materially. It is even reasonable to expect a reversal of the trend in number of farms due to an anticipated interest and growth in irrigation. During the 5-year period, the average size of farms increased from 9,720 to 12,650 acres.

The average gross income from all farm products sold increased 220 percent from 1944-1949 and ranks well above the average for the State of Texas. In 1944 about 80 percent of the farm income was derived from livestock and livestock products; in 1949 this source provided only about 50 percent of the farm income. The decreasing importance of

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livestock raising to the area, expressed in terms of percent of total farm income, has been accompanied by the relatively recent and rapid expansion of irrigated land, most of which has been devoted to the growing of cotton.

Local bankers reported that the ranchers were in good financial condition and that adequate credit for operating purposes was available. Based on financial statements of three banks in the area, the ratio of deposits to loans is 2.7 to 1.0.

Some trends are shown in Table IV which reflect various aspects of the economy of the area.

TABLE IV
TRENDS RELATING TO ELECTRIC POWER CONSUMPTION

Item and Relationship	Trend			
<u>Average Gross Income From</u>				
<u>All Farm Products Sold</u>	<u>1939</u>	<u>1944</u>	<u>1949</u>	
5-County Area	\$5,566	\$9,040	\$28,970	
State of Texas	\$1,050	\$2,598	\$ 5,287	
Ratio Area to State (%)	530	348	548	
<u>Average Value of Land & Buildings</u>				
	<u>1940</u>	<u>1945</u>	<u>1950</u>	
5-County Area	\$35,152	\$54,545	\$161,258	
State of Texas	\$ 6,196	\$ 9,286	\$ 20,269	
Ratio Area to State (%)	567	587	796	
<u>Total Population</u>				
	<u>1920</u>	<u>1930</u>	<u>1940</u>	<u>1950</u>
5-County Area	19,978	23,317	26,108	27,942
State of Texas	4,663,228	5,824,715	6,414,824	7,711,194
Ratio Area to State (%)	.004	.004	.004	.004
<u>Farm-Operator Family Level of</u>				
<u>Living Index (U. S. 1945=100)</u>	<u>1930</u>	<u>1940</u>	<u>1945</u>	<u>1950</u>
5-County Area	76	100	110	167
State of Texas	68	76	98	127
United States	75	79	100	122

ANALYSIS OF KWH CONSUMPTION

The estimated kwh consumption for farm and ranch consumers for this proposed system is based on the sample data, other economic information acquired in the area, and secondary sources.

At the time of the appraisal, such matters as rates and minimum monthly bills had not been decided upon. The respondents' position on these matters is contingent upon whether in their opinion the rates to be put into effect are reasonable.

Several of the ranch respondents stated they planned to have more than one household and the accompanying electric appliances served through a single meter and were so reported on the schedules by the appraiser. In the event this practice is permitted, an average of 448 kwh per month is indicated within 3 years following energization. If each dwelling is required to be metered separately, an average of 360 kwh per month is indicated. Although about one-half of the respondents have invested in home electric plants, all of them expressed interest in receiving central station electric service. The appraiser observed a considerable number of appliances powered by these home plants, and it is reasonable to assume that these appliances or similar ones would be brought on the lines immediately following energization. It is believed that the respondents have money to purchase the appliances they said they planned to buy. However, experience has shown that respondents who are desirous of receiving service often overstate their expectation. It is not probable that additional appliances will be added as rapidly as stated by the respondents.

The use of LP gas is well established in this area, partly because it has had virtually no competition from other sources of energy. It is so well entrenched that about 50 percent of the respondents stated they intended to continue its use for cooking and house heating. One-third planned to continue use of gas for water heating, and one-fourth for refrigeration. To the extent the respondents continue to use LP gas, the fullest utilization of electricity will not be realized and the average kwh consumption will be deterred. Data concerning the respondents' position with respect to use of LP gas is presented in Table V.

TABLE V
STATUS OF LP GAS IN AREA

Respondents' Position With Respect to Use of LP Gas		Number	Percent of Total
Not Using and Not Planning to Use		5	12
Presently Using		<u>37</u>	<u>88</u>
Total		42	100

Specific Uses	Now in Use		Planning to Change to Electricity		Net Uses Not Changing to Electricity	
	Number	Percent	Number	Percent	Number	Percent
Cooking	35	83	14	33	21	50
Refrigerators	30	71	20	48	10	23
Water Heating	27	64	14	33	13	31
House Heating	22	52	0	0	22	52

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It might reasonably be expected that 50 percent of the water systems, water heaters, and air conditioners that were indicated will be installed in 3 years. For ranges, refrigerators, and cabinet freezers, 75 percent of the indicated might be attained in 3 years. All consumers are expected to have house lighting, and it is believed that productive and other uses will be added at a rate of about 75 percent within the next 3 years.

TABLE VI
INDICATED AND ESTIMATED KWH USAGE, FARM AND
RANCH CONSUMERS BY CHARACTER OF LOAD

Uses	Saturation	Indicated		Estimated Annual
		KWH		KWH
		Per 100 Consumers	Percent of Total	Per 100 Farm and Ranch Consumers
<u>Major Household Uses</u>				
Water Heater	50	150,000	34.7	75,000
Freezer Cabinet	75	71,700	16.6	53,775
Range	30	36,000	8.3	27,000
Air Conditioning	11	35,200	8.1	17,600
Refrigerator	77	27,720	6.4	20,790
House Lighting	100	24,000	5.7	24,000
Water System	59	20,300	4.7	10,150
<u>Productive Uses</u>		17,821	4.1	13,366
<u>Other Uses</u>		49,269	11.4	36,952
		432,010	100.0	278,633

Annual average estimated kwh for farm consumers 3 years following energization	2,786
Monthly average estimated kwh for farm consumers 3 years following energization	232

Historical data on an REA-financed system operating in southwest Texas, about 250 miles from the proposed system, is shown in Table VII.

TABLE VII
DATA ON NEIGHBORING SYSTEM COMPARED WITH PROPOSED SYSTEM

	Months Energized	Average Income From Sale of Farm Products	Average Size of Farm 1950	Average Monthly Kwh for Farms				
		1949		1948	'49	'50	'51	'52
System A	55	\$16,802	3,830	102	141	145	184	230
Proposed System	--	28,970	12,650	--	--	--	--	--

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The monthly kwh consumption for farms on system A has increased at a rate of 32 kwh each year since energization. Although the average farm income for farms in the proposed system's area, as well as the average size of farms, is considerably larger than that of system A, it is believed that the rate of increase in kwh consumption is likely to be similar. An estimate for initial farm consumption is arrived at by reducing the amount that is thought likely to be achieved in 3 years at the rate of growth that is expected to occur on this system. When the estimate of 232 kwh, which was derived from indications of respondents as likely to be attained in 3 years following energization, is reduced by 32 kwh each year for 3 years, an initial consumption estimate of 136 kwh is reached. Using the initial consumption of 136 kwh, 232 in 3 years, and the average rate of increase of 32 kwh each year, the estimates of 200 kwh in 2 years, 300 in 5 years and 450 in 10 years is believed to be realistic. Indications are that few small commercial establishments would be served in the foreseeable future. Most of these would come into existence as a result of the growth of communities in the area where irrigation is being developed. It appears reasonable that consumers in this class might attain average consumption of 400, 450, and 500 kwh in 2, 5, and 10 years following energization.

IRRIGATION

Because of the extremely low density of farm and ranch units and the unlikelihood of having any appreciable number of other types of consumers in the area, it is doubtful that this proposed system would be feasible without the prospect of a very large and dependable irrigation load. For this reason careful study should be made of all the facts relating to the irrigation potential.

According to the 1950 Census of Agriculture, Culberson County had no land in irrigation; however, 79,713 acres in the other four counties in the proposed service area were irrigated in 1949, an increase of 211 percent over the 1939 acreage. It was reported that about one-half of the irrigated land was watered from wells. In 1950, 421 irrigation pumps were reported in service; of this number, 339, or 80 percent, were powered by engines and motors other than electric. Continued growth in the number of irrigated acres has occurred since the census data was taken.

The appraiser reports that the areas wherein the greatest amount of irrigation is being carried on are the (1) Dell City area, (2) Van Horn or Lobo Flat area, (3) Pecos area, and (4) Marfa area. Characteristics of each area as reported by the appraiser are presented below.

Dell City Area: This area lies in the extreme northwest part of Hudspeth County. Irrigation has been practiced in this section for about 5 years. Signed applications for electric service to 109 wells are on

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file, and an additional 200 wells are considered excellent potential consumers. All of the signed wells and most of the potential wells are in operation using butane or fuel oil motors. For the most part electric motors of 100 horsepower capacity would be installed to replace the present motors. Depth of ground water ranges from 50 to 150 feet. The soil is well suited for irrigation. From one and a half to three bales of cotton per acre is the average yield.

Van Horn or Lobo Flat Area: This area lies in Culberson County south of Van Horn. About 20,000 acres are now irrigated by 135 wells. The average lift is about 150 feet. Much of this area has been developed recently, and many of the farms have only barracks to house workers during the planting and harvesting seasons. Most of the land owners live in nearby towns.

Pecos Area: About 120,000 acres are now under irrigation in this area which lies south and west of Pecos in Reeves County. An additional 200,000 acres may be irrigated in the near future. About 200 irrigation wells are now in operation and it is possible that this number will reach 500 when the full irrigation potential is developed. The average lift per well is about 180 feet, and the electric motors would average about 100 horsepower. Although few of the land owners live on their farms, some type of dwelling is on nearly every 80-acre tract.

Marfa Area: About 9,500 acres of land suitable for irrigation farming were noted along the Rio Grande River in Presidio County.

All proposed irrigators expected to raise cotton and about one-fourth alfalfa. An average of 180 acres of cotton and 51 acres of alfalfa were indicated annually per irrigator. The total irrigated acres listed in the schedules was 47,200. Ninety-one percent of this total is cotton; 7 percent alfalfa and the balance miscellaneous crops. The average number of irrigated acres per well is 194.

An average annual consumption of 60,480 kwh per well for the 10 years following energization appears reasonable.

